Agenda: Ingredients of a Successful Algebra Program in Middle School

Regional Educational Laboratory Central

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Overview

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Transcript

MIKE SIEBERSMA: Welcome, everyone. And thanks for joining us for this webinar. It looks like it's the top of the hour and probably time for us to get started. You've joined a webinar called "The Ingredients for a Successful Algebra Program in Middle School," sponsored by the Institute of Education Sciences at the U.S. Department of Education and presented today by the Regional Educational Laboratory Central.

So, as I mentioned earlier, this webinar is presented by REL Central. REL Central is one of 10 regional education laboratories across the United States. Each of us Regional Education Labs, or RELs, is funded by the Institute of Education Sciences to conduct applied research and trainings with the mission of supporting a more evidence-based education system. We at REL Central serve the states of Colorado, Kansas, Missouri, Nebraska, North Dakota, South Dakota, and Wyoming.

So, through REL Central, all of our work is done in partnership with the stakeholders from our states. And we conduct applied research. And we do trainings that are designed to solve high-leverage problems for our partners. And one configuration of a partnership that we use is called an "alliance." So, our definition of an alliance is a group of stakeholders from multiple states that come together on a topic of shared interests.

And so this particular body of work that we're going to be covering today was conducted through our College and Career Readiness Research Alliance, which is, as we say here, an alliance united by goals ensuring that all students graduate from high school prepared to enter the workforce or enroll in postsecondary degree or certification programs. The alliance has two core focus areas, one of which is success assessment. The other is Algebra I readiness support. And, as indicated by the arrow, the body of work that we'll be covering today is associated with that second focus area.

And I'm really proud of the panel of researchers and practitioners that we have here to present today. I am Mike Siebersma from REL Central. And, as I said before, we'll be helping with

moderating some of the Q&A and that sort of thing. As we go through the webinar, we'll ask each of our panelists and presenters to introduce themselves and give a little of their background as they come on board to share what they have to share.

So, as I said, you joined a webinar called for a Successful Algebra Program in Middle School." We're really excited to share some of the research findings that might inform your development and/or improvement for a program of teaching algebra in middle school. The topics range from what research says about the gravity of the decision, to put a middle school student into an algebra class to which students' foundational skills may indicate that they're ready to be successful in algebra, to which teachers have characteristics associated with student success in algebra and middle school.

So, those are some of the ingredients that we're going to cover. And in order to do that, we're going to look at some of the existing research on factors associated with student success. We want to give you an overview and review some findings of a brand-new study out of REL Central about foundational skills that are associated with student success—and particularly students in Missouri, the focus of the study—and look at some potential policy and practice implications.

And then we also want to bring in practitioner voices. So, we have a couple of folks from districts who can talk about how the research bumps up against their experience in practice in designing these types of programs. And with that, I want to turn it over to my colleagues, who are going to take us forward through the webinar.

DOUGLAS VAN DINE: Thank you, Mike. So, I am Doug Van Dine. I'm a senior researcher at REL Central. My background is in mathematics, from pre-K all the way up through high school, but most of it teaching middle school and high school math.

So, to give a little background to why we're here today and why this study, the question comes to mind, why offer Algebra I in middle school? As many of us know who work in education and in math in particular, there's a lot of research that shows those higher-level math courses—students who are successful in those higher-level math courses in high school tends to set the stage for success not only in college and STEM careers, but later careers moving on. So, a lot of effort is put into helping students be successful and reach those higher-level math courses.

So, we're going to start today with a quick poll. And we want to know, just with the people who are here, does your district offer students the option of taking Algebra I in middle school? And you should see a poll pop up on your window.

So, it looks like most people go ahead and responded. And we have about 83% to people saying, yes, we do offer algebra at the middle school level. A couple people said no. A couple people aren't sure. And the general trend has been to push math down into the middle school level with that goal, again, of getting those students to those higher-level math courses.

So, when we think about reaching those higher-level math courses, there are a couple decision points that districts look at to say, when is the right time to move them? The first decision point

schools look at is accelerating students after grade 8. And schools who choose this option generally look at moving into advanced or accelerated courses for algebra and geometry in high school in order to reach that calculus level by the senior year. So, it looks at condensing the high school coursework in order to reach those higher-level math courses.

There are also districts who look at accelerating after sixth grade and taking that middle school and really condensing it down into one year. So students start algebra in grade 7, which also moves geometry down into middle school. And there are challenges with that.

In Missouri, the state that we looked at, we're looking at kind of the Goldilocks scenario, looking at that middle ground, looking at just making a decision to move students into algebra after grade 7. So this is the decision point that we're looking at accelerating them. They've completed grade 6. They've completed grade 7. Now, who do we want to enroll in algebra in grade 8?

Our colleagues in REL West did a study looking at California in particular. And in that, they looked at other research. And when we're looking at this decision, people often look at time points, like I said—grade 7, grade 8, grade 7. But the reality is what we need to think about is not when should they take them but are they ready to take algebra. And at what point are they ready to take algebra?

So, there is solid evidence that's out there looking at those prerequisite skills and whether they've been mastered as a decision point for deciding who should enroll in algebra and why that's important. In their study when they looked at those students in California—again this is that REL West study—they found that of the students who enrolled in algebra, when they failed they tended to continue on that path.

Many students who failed algebra the first time tended to not be successful the second time as well. And that automatically shifts them off the course that we want them to be on. We want them to get to those high-level math courses and find that road to success because being successful there sets the stage.

So, we want to make sure that if we're moving this algebra into middle school and we're starting them in grade 8 that we're not starting them on the wrong foot, that we're really setting the stage for success as they move into high school and those higher-level math courses. That's kind of the rationale for why we did this. I'm going to shift gears and turn it over to Mary, Mary Klute, who is the lead author on the study that we're going to talk about and focus on today.

MARY KLUTE: Thanks. So, I'm Mary Klute. And through my work for REL Central, I had the pleasure of collaborating with the Missouri Department of Elementary and Secondary Education on the study that I'm going to be talking about today. And I'd also like to take a moment to acknowledge my collaborators in the study, Barbara Dougherty from the University of Hawaii and Doug Van Dine, who you just heard from, from Marzano Research. And Angela is going to populate the report in the chat box if you're interested in taking a closer look after we talk today.

So, as Doug just described, offering Algebra I to middle school students if they are ready can create opportunities for students to take more advanced math courses in high school. But if

students aren't ready to take Algebra I in middle school, accelerating them might have unintended consequences. If they aren't ready, they might struggle in their Algebra I course. And previous research, as Doug just noted, suggests that students who struggle in Algebra I may actually be less likely to go on and take higher-level math courses.

So how can we identify which students are ready? So, REL Central conducted the study in partnership with the Missouri Department of Elementary and Secondary Education, or MO DESE, to try to shed some light on that very issue.

MO DESE doesn't issue any guidelines for determining which students are ready to enroll in Algebra I in middle school. And so, not surprisingly, the approaches to accelerating students vary quite a bit across the state. Some districts accelerate all students into Algebra I in middle school and others factor in other sources of information, like student interest, teacher recommendation, parent requests, or previous enrollment in honors courses.

Some previous research has shown that scores on Algebra I or placement tests might be—that those might be good indicators of who's ready to take Algebra I in middle school. But that's another test. And, so, with this study, what we wanted to do was to see if the scores on an assessment that all the students already take—that being the grade 7 state mathematics assessment—could be used to identify which students are ready for Algebra I in middle school.

So, what we did was rather than just looking at the overall score on the grade 7 mathematics assessment, we looked at the scores on the five domains that are assessed. And this slide presents a description of the five domains assessed by the grade 7 Missouri Assessment Program mathematics assessment. And there's a lot of words on this slide, and I'm not going to read them to you. I'll just pause for a minute to give you guys a chance to read it.

So, the study examined associations between the scores on those five math domains assessed by the Missouri Assessment Program in grade 7 and students' performance on the Algebra I end-of-course assessment in grade 8. We examined the extent to which each of the domains was associated with Algebra I performance. And we also examined whether the strength of those associations varied for specific subgroups of students, specifically students who identified as English learners and students receiving special education services.

In thinking about the results of the study, it's really important to keep in mind that this study used existing assessment data that was already collected by MO DESE. All of the students in the study were already accelerated into Algebra I. And as I mentioned previously, districts in Missouri use different approaches to determining which students were accelerated. In some districts, it was all the students. In others, it might have been based on prior math achievement.

We don't have any information about what factored into these students being accelerated into Algebra I in eighth grade. But what we do know is that, on average, the students in this study did quite well on the end-of-course algebra assessment. The average score in the sample was about 412 and scores of 409 or higher are considered advanced. So it's possible that the results of the study might have been different if a more diverse sample was studied. So now I'll turn to our findings.

So, our first research question was focused on the extent to which each of the domains was associated with performance on the Algebra I end-of-course assessment in the sample as a whole. The second column of this table shows that all five domains were significantly associated with Algebra I performance. The strongest association was for expressions and equations, with a coefficient of 0.21. If you look to the column on the far right, you can see one way of interpreting what that 0.21 coefficient means.

Each of the domain scores is scored as a percent of the items that the student got correct. So, that column on the right tells us how much of a change in algebra score you'd expect to see with a 10% change in the domain score. And so you can see in the third column that a 10% change in the number of items or the percent of items correct in the expressions and equations domain is associated with the 1.22-point increase in the Algebra I end-of-course assessment.

So, imagine that you had two students who had the same scores on all of the other domains. But maybe one got 80% on expressions and equations, and the other got 90%. You'd expect that second student to score about 1.22 points higher on the Algebra I end-of-course assessment.

Now, you might be thinking, what does 1.22 points mean? So, to put that in a little bit of perspective, we looked at what the ranges are for this assessment. So, you know all of these assessments typically have ranges like basic, below proficient, proficient, and advanced. Well, that proficient range for the Algebra I end-of-course assessment is nine points wide. So, an increase of 1.22 points is a little over an eighth of the way across that range.

The coefficient for ratios and proportional relationships was the weakest of the five domains. And it had a coefficient of 0.1. A 10% increase in the number of items correct for this domain is associated with an increase in the Algebra I end-of-course assessment of just about 0.78 points, which is about 1/12 the way across that proficient range. So, it's a lot weaker.

Next, we wanted to look to see whether the strength of these associations varied for students who were and were not identified as English learners. We found a significant difference for one domain, the number system. Specifically, the strength of the association between the score on the number system domain and the Algebra I end-of-course assessment was almost twice as strong for students identified as English learners as it was for students who were not English learners.

So, you can see on the slide that for students identified as English learners, a 10% change in the domain score is expected to be associated with an increase of 1.55 points on the Algebra I end-of-course assessment. So if you have two students identified as English learners who have the same score on all of the other domains, but maybe one got 70% on the number system and the other got 80% on the number system, you'd expect that second student to score about 1.55 points higher on the Algebra I end-of-course assessment. And then, again, to put that in perspective, that's over one sixth of the way across the proficient range.

And when looking at this finding, though, it's important to keep in mind that the sample of students identified as English learners was quite small. It was just 228 students out of our entire sample of over 11,000 students. So, more research is definitely needed to support the generalizability of this finding.

All right. So then next, we performed similar analyses comparing students who were receiving special education services to those who were not. We did not find any differences in the strength of the associations between the domain scores and the Algebra I end-of-course assessment for these two groups.

Once again, the students receiving special education services was quite a small group. There was just 170 of them out of our whole sample of over 11,000. And in addition, it's always important to keep in mind that students receive special education services for myriad reasons. And unfortunately, our data set didn't contain any information about the nature of students' disabilities.

All right. So that pretty much covers the main findings of the study. So now I'm going to go ahead and turn it back over to Doug.

DOUGLAS VAN DINE: Sorry. Having trouble unmuting. So, thank you, Mary. And just a reminder that as we go through the presentation, if you have questions, please use the Q&A option in Zoom to type those in. Mike is keeping an eye on those.

We're sharing two research reports that we did as REL Central. So, we have some voices from the researcher. But we also wanted to include some voices from the field. So, we've invited two people from different states and different districts to join us today to give us some picture of what actually happens in a district.

So, I'm going to introduce them and let them talk. And then I'm going to ask them some questions. But if you have particular questions, again, use the Q&A box. And we'll try to get to as many as we possibly can. So, we're going to start with John. I'll let you introduce yourself, John.

JOHN DOWNS: Hey, Doug. Can you hear me?

DOUGLAS VAN DINE: Yep.

JOHN DOWNS: My name is John Downs. I'm the superintendent of a smaller district in Central Missouri. This is my 24th year with the district. I want to thank you for the invitation to participate today.

DOUGLAS VAN DINE: Thank you, John. And Jen?

JENNIFER OVERLEY: Hello. My name is Jen Overly. I am an educator of 30 years, spent most of that time in K-5 education, but spent 10 of those years as a K-8 mathematics coordinator for my district in Cherry Creek School District in Colorado.

DOUGLAS VAN DINE: Great. Thank you. So, we purposely chose two different states. We purposely chose a small rural district and a larger suburban district to give different perspectives. So since Mary just shared with us this idea of looking at foundational skills for students, I

wanted to ask you both—and we'll start with you, John—how do you make decisions in your district about which students to enroll in Algebra I classes in middle school?

JOHN DOWNS: So, to provide you with just a little bit of context, we're historically a rural district. And we will be transitioning to a more suburban district—we're just outside Columbia, Missouri—over the coming decades. Our current total K-12 student enrollment is approaching 1,500 students. So, we're still modest in size. We have three middle school math teachers, one per grade level.

So, in the past, our approach to placement of students into middle school algebra, which we offer in eighth grade only currently, was inconsistent for many years. We were utilizing a variety of criteria, trying different things over different years.

And many of those criteria included subjective and unreliable metrics—things like student participation as gauged by the classroom teacher. Student effort as gauged by the classroom teacher. Quarter and/or semester grades in their seventh-grade mathematics class, which includes things like homework completion, which is notorious for being subjective. Unit test results, which were often teacher-created tests, which is fine, except that when you see the kind of high turnover that we experience in a smaller district, which tends to be in the range of 11% to 13% annually, that means you're often onboarding younger teachers who need some coaching up on creating valid and reliable assessments.

And, so, what we found was the criteria for placing students in class was mostly based upon which students played school the best. And we have in recent years been transitioning toward more reliable results, like administration of the Iowa Test, inclusion of prior year state test results on the mathematics MAP exam.

But that's been very much focused on the student's overall status result—that is, if students achieved advanced status on the state test in sixth and seventh grade. So, the findings are really encouraging to us because it allows us to adjust our identification criteria with special emphasis on results from the expressions and equations domain—so we give that a little bit more weight in our decision-making process—and then also attention to results on the number system domain for our English learners.

DOUGLAS VAN DINE: Thank you, John. And shifting gears now to Jen, same question to you.

JENNIFER OVERLEY: Well, we're a large—probably the third largest school district in Colorado. And, so, our demographics is a little bit different than John's. We have six high schools and 12 middle schools. So, you can imagine how many teachers we have at the middle school level. A lot of what John just shared is similar to our experience as well in a larger school district.

But we're very site-based and very proud of that site-based system for many, many years. But as we saw standards coming in, we just saw more and more issues that were coming to play with that site-based system. So, we did decide to come up with some district guidance. And that was not easy. We were met with a lot of pushback on that because schools are really embedded in the professional learning that they do together and their systems that are in place.

So, we did come up with some guidance and agreements. And we were able to, with many meetings, get everybody on board to at least agree that they would do some of these things. So before, just like John shared, we just had a random number of systems that allowed students to access higher-level courses. And the higher-level courses kept coming down and down and down into middle school just because it became more of a competition between sides of our districts.

So, we were really trying to eliminate that whole idea. We streamlined the courses and eliminated all of the courses meant to address the students who weren't ready for algebra by ninth grade and also bringing—we really tried to eliminate those high school classes actually coming down into the middle school, with the exception of algebra.

So, our biggest points of streamline were the assessments that students were given at two points, one from fifth to sixth. And, so, we had utilized a compacting of the entire middle school grades into two years. So, sixth and half of seventh would go in sixth grade. And half of seventh and all of eighth would go in seventh. And then by eighth grade, students could take algebra. But they had to take that assessment from fifth to sixth.

So, every elementary school student at fifth grade was given that. It was an assessment that the mathematics coordinators wrote in conjunction with just some research and best practices. It was more looking at the incorporation of standards for math practice and tasks to elicit higher-level thinking. So, we actually did district grading days for those to determine who could enter that pathway there.

And then our second point of entry was that seventh to eighth grade. So maybe a student got into middle school and decided that they would like to enter algebra at ninth grade. And then they were also given an assessment that included standards from the algebra standards as well or items from algebra standards as well to see if they could transfer knowledge and be ready for that. So those were our two points.

And it has worked fairly well, although the grading is still subjective. And we miss a lot of kids. And we're still seeing that inequities in our district, where we're mostly a white district. We do not have enough kids of color coming into mathematics at that point. This research is interesting to us.

DOUGLAS VAN DINE: Great. Thank you, John and Jen. So, I'm going to pause for a minute to turn it over to Mike to see if there are any questions at this point.

MIKE SIEBERSMA: Yeah. We actually have a number of questions, I think maybe about six, that I'd like to put to certain people who have contributed so far. So, if you can help us get through that sequence of questions, that would be great. The first one that came in I think I'll pose to Doug. And it was about the course sequence and where data science fits within the course sequence, whether in middle school or high school.

DOUGLAS VAN DINE: So, the study that REL West did actually looked at STEM in general. So, they looked at science, technology, education, and math. We just focused on the math piece for this. Data science is one of those areas that doesn't quite fit into the math. So, I think that's kind

of outside of where we were thinking. But I can share the link to that REL West report if you want to look at that piece a little more in depth.

MIKE SIEBERSMA: Great. Thanks, Doug. And there's a number of questions that have come in regarding disaggregating the findings of this study by race. Were we able to disaggregate by race? And if so, was there anything to share about that?

JENNIFER OVERLEY: We did not disaggregate the findings by race. And I was just looking to see. The sample was about 78% white. And that was the most predominant racial or ethnic group. And, so, we did not disaggregate by race.

MIKE SIEBERSMA: Great. Thanks, Mary. This one is not specifically about the findings of the study but the take of our panelists and experts on thoughts on, how do we get—so the current study described what happens for students who take the seventh grade math exam and then go into Algebra I and outcomes. What about the idea of encouraging more participation from historically underserved, marginalized student populations to get more of them into higher-level math classes?

So, I'm not sure who would like to speak to that one. But we have a couple of questions that are kind of that nature. Can I see what Jen would say about that first?

JENNIFER OVERLEY: Yeah. That was one of the issues that we were faced with quite often. And at the time, one of the best ways that we were trying to implement more students getting into algebra by ninth grade or eighth grade, which was also a possibility, was eliminating all of those courses that were just meant to address all the students who were not prepared—not for any reason other than the classes they had taken previous—were not prepared for algebra by that time.

So, as my concentration was in K-5, we really worked very hard to detrack our schools. And so if there was no opportunity to take algebra in fifth or sixth grade, that wasn't going to push down into having to compact multiple grade levels. As early as kindergarten is what we were saying. So, detracking was perhaps maybe the most important move that we made.

And I can't say that we detracked our district. We made great efforts to do that. And we had a lot of people on board in agreeing to do that. That just meant students were taking first grade in first grade and second grade in second grade all the way up to middle school. And teachers were getting professional learning to better understand the mathematics that they taught so they could address multiple levels in their classrooms. So that was our biggest push.

MIKE SIEBERSMA: Great. Thanks, Jen. Doug, any thoughts from you on the idea of detracking or the possibility that research like this might lead to tracking students into high school and determining their outcomes ahead of time?

DOUGLAS VAN DINE: I think that's a constant challenge. Any time you make a decision to move a student, there's always that potential to put them in a track. I don't think accelerating a student

in general automatically leads to tracking. I think that's kind of a district-by-district idea. But when I look at what research has shown and I look at districts who have been successful, there's this constant stepping back to look at students.

It's not just deciding, in seventh grade, we're going to put them on this track in Algebra I. It's stepping back at every point at the end of each year to say, how are they doing? How are they being successful? What options do we have? So, I think that's the key to making sure that tracking doesn't happen—is that there are options at every point for students to consider as they move forward through the coursework.

MIKE SIEBERSMA: Great. Thanks, Doug. John, any thoughts on getting more diversity into higher-level math or the phenomenon of tracking in your context?

JOHN DOWNS: So, what we've observed in our district is there's no predictable, observable trend with respect to racial and ethnic minority achievement. And that's really just because our numbers are so low that it doesn't allow us to draw meaningful conclusions about any kind of achievement gap.

We do see a predictable, observable gap between students who are eligible for free and reduced-price lunch and students who are not, which goes hand-in-hand with what is seen everywhere in our nation. So, much of the push that we make is to provide additional supports for our students who come from lower-income households to provide them with additional supports beginning as early as when they enter in preschool and kindergarten to help ensure that they're as ready as possible by the time that they get to middle school.

With respect to enrollment, our enrollment in eighth grade is diverse. But again, only because our diversity is so low, we see that those percentages bear out in practice as well. So that's encouraging for us. But we are always searching to find what we can do more for our students who are eligible for free and reduced lunch.

On the topic of tracking, interestingly, in a smaller district, that tends to be less of an issue. As I mentioned earlier, I have three middle school math teachers. I likewise have three high school math teachers. So, our offerings are restrained. And pretty much everybody takes the same course sequence with a few small differences along the way.

MIKE SIEBERSMA: Great. And this one will go to Mary. There was a question about the overall findings. And I think that it's fair to say and share that the performance on all domains on the seventh-grade math assessment correlated to higher scores which varied by domain on the end-of-course assessment for Algebra I. One of the questions is, would it be good policy to use student scores on that specific expressions and equations domain, perhaps above others because it has that higher impact or that higher correlation to performance on the end of course?

MARY KLUTE: So, we did find in the study that the five domains on the Missouri assessment were pretty highly correlated with each other. And so these five areas kind of did—students tend to be high in all of them or low in all of them, for the most part. But we did find that, yes, the

association was strongest for expressions and equations, which might suggest that that might be an area to pay a little closer attention to—that you might consider doing that.

We definitely would say this should not be—we're not purporting that there's a certain score; if they get that, then they're in Algebra I. We definitely think this is just one more piece of information that educators might use in addition to the other sources that they use to determine which students are ready.

MIKE SIEBERSMA: Great. Thanks, Mary. We have a couple other questions that we'll try to get to as we enter another Q&A phase. For the pacing and for the time, I'd like to forward us on to some overview of some of the findings from another study that we conducted related to this topic.

JOSHUA STEWART: Great. Thanks, Mike. So, I'm Josh Stewart, a senior researcher here at REL Central. And I'm the author on a companion piece to the study that Mary described entitled "The Associations Between Middle School Algebra I Teacher Qualifications and Student Achievement."

So, thinking about the question "who should teach Algebra I at the middle school level?" we examined the link between teachers' backgrounds and the success of their students in those middle school classes. So this study was requested by the Missouri Department of Elementary and Secondary Education to better understand the link between specific teacher qualifications and the success of their students, knowing that this is a gateway course and that students who don't succeed run the risk of being turned off from higher-level math courses down the road.

And there's also a concern that if teachers are at the middle school level, they might be reaching the height of their knowledge of mathematics. And so as students are transitioning into this more complex topic, it was really important to the Missouri Department of Elementary and Secondary Education to also consider what qualifications the teachers bring to the table that can help students navigate this more complex course.

So, this brings us back around to the rationale for this particular REL study, in which we sought to examine particularly qualifications associated with knowledge to teach mathematics and the association between those qualifications and the success of their students at the middle school level. So, we included 429 middle school teachers and over 11,000 middle school students. And these data come from the 2015-2016 school year.

So, thinking about teacher qualifications, prior research has indicated that teacher qualifications can play a role in student success in Algebra I as students transition into this more abstract topic. Prior research has largely focused on teachers' content knowledge to teach mathematics. And in particular, we're thinking about things like teachers' educational level—so whether or not they had a master's degree, a bachelor's degree, a doctorate degree.

Certifications to teach middle school or high school—so in Missouri, as in a lot of other states, teachers can teach content up to Algebra I, which would be up to grade 9. And a lot of those teachers are staffed at the middle school level. Or they could have a certification that allows

them to teach high school courses, content beyond Algebra I. I'm thinking about things like calculus and trigonometry.

We also wanted to consider scores on certification exams, particularly those associated with mathematical content knowledge, for those teachers who are instructing courses at the middle school level in Algebra I. And really, we were thinking about the same exam that Mary described earlier—so the Missouri Assessment Program end-of-course Algebra I assessment—as our primary outcome for student success.

And so really just trying to drill down into the knowledge base of the teachers and which of those qualifications might give you the biggest bang for your buck, considering that, again, this is a more complex topic. And so you want to make sure that not only do the students have the foundational skills that we were just talking about, but also that the teachers can guide them through this more complicated course, which is one of the first subject-specific courses related to the Assessment Program that students can take.

So, thinking about what we found for our study, teacher performance on math certification exams [INAUDIBLE] experience teaching math were the qualifications that were most strongly associated with student success in general. But to the question earlier, looking at different subgroups, teacher performance on math certification exams and years of experience were also strongly associated with achievement for underrepresented and disadvantaged student subgroups. So that was really important for us to investigate in this study—thinking about how those teacher qualifications map onto potential outcomes for students in general, as well as students in those subgroups.

So, here you'll see a breakdown of the findings I just described but in a little bit more detail. So, the first column indicates the teacher qualification. The second column represents whether the qualification was associated with success for students in general. So if you see a yes in that first column, it means that we found a relationship between that particular qualification and student achievement in general.

And the third column represents whether or not the qualification is associated with student success for underrepresented and disadvantaged subgroups. And so when we're thinking about underrepresented, we primarily are going to focus on Black and Hispanic students, disadvantaged students, students who are eligible for the Federal School Lunch Program, or students who are eligible for special education services.

And here you can see, in addition to the certification exams, which are largely the Praxis, since Missouri just switched to their own certification exam— historically there were a lot of Praxis exam scores in there that were associated with student success. But we also looked at some additional variables here, thinking about looking across the board. You can see in general, though the content or even though the exam varies, generally speaking, certification exams had that strong relationship for students in general, as well as underrepresented and disadvantaged students. Same thing for years of experience.

But the two, I would say, specific qualifications that were not associated with students in general, but for either underrepresented or disadvantaged subgroups, were education specialist degree—so those were things like teachers who might have had a doctorate in educational psychology, school psychology, curriculum and design—as well as certification type. And so teachers who had a continuous certification—this meant that they had progressed from the initial certification to their continuous certification after five years—were associated with stronger performance for their students who were eligible for the Federal School Lunch Program.

And so that gives you a little bit of a breakdown of thinking about the qualifications of teachers, what they're bringing to the table, and how those might be associated with the success of their students as a companion to thinking about the foundational skills that students are themselves bringing to the table.

So, at REL Central, we like to make our findings accessible. And I think that speaks for all the RELs. So in an effort to disseminate our findings, we like to produce things like snazzy infographics. So here, you'll see that we've distilled the study that I was just describing into an infographic in order to make it accessible to a broader audience who might not be able to read the full length report.

And so here, you'll see that the qualifications I just described are represented by icons. And we really just distill those main findings that we talked about. We're thinking about years of experience teaching now and those certification exams are the biggest or the strongest factors associated with student success amongst those teacher qualifications.

And it's important to note that we did include a number of other certification exams, other pieces of teacher background information. But other things that a district might have access to they might be able to make a decision about. We tried to focus on high-leverage findings that might be of interest to districts as they're thinking about staffing those Algebra I courses at the middle school level.

It's important to remember, too, that this study is correlational in nature. So, we're thinking that even though we've taken into account a lot of teacher qualification variables, at the end of the day, more rigorous research could be conducted in the future to look at the relationship between the qualifications and student success in Algebra I.

But this is a great addition to the existing body of research that looks at, again, thinking about educational background and what the teacher is bringing to the table in terms of their degree, thinking about their certification, and thinking about their background in—or sorry, their prior certification exams. One thing that I thought was interesting was that the study team did not find that educational background, particularly master's degree, doctorate degree, or having majored in math—those variables were not associated with success for students.

DOUGLAS VAN DINE: Great. Thank you, Josh. And Angela put a link to the infographic in the text box or the chat box if you didn't see it. So, I want to turn back again now to our two voices from the field, John and Jen. We've already asked you a little bit about students. And now we

want to turn the lens, following what Josh shared, to teachers. So again, starting with John, how do you determine which teachers will teach Algebra I in the middle school?

JOHN DOWNS: So, again, just to recap some things I said before, our total K-12 enrollment is 1,500 students. We have three middle school and three high school mathematics teachers. The way we have structured our departments historically, we had one math teacher for all of eighth grade math. And so that person teaches Algebra I typically for one hour a day.

In Missouri, like most other states, we have an observable critical shortage of math teachers throughout the state. And, as I mentioned before, our district turnover is about 12% annually. So based on that, what we struggle with is always finding high-quality teachers to staff every one of our positions. And so sometimes we have had to staff just based on teacher availability and whether or not people meet the certification threshold, which in Missouri for middle school is a 5 through 9 mathematics certificate.

We've done prior experiments in being more expansive with middle school algebra. And those weren't successful. And teacher experience, I think, is one of those reasons. We overidentified some students who we, in retrospect, believe probably weren't adequately prepared for algebra coursework. And then some of the classes, because we were including more students, were taught by people who had the appropriate certification but didn't really have experience having taught mathematics before.

And, so, our big takeaway from this study is that we're going to make it a priority in the future. When we make assignments to that eighth grade position or when we make hires in our mathematics department, we'll be very focused on mathematics content area certification exam scores, as well as the years of experience teaching mathematics, including high school-level courses. So, we're very fortunate because right now, our eighth-grade math teacher is a former high school teacher. And so that's a great placement. Hopefully she'll stick around for the next 30 years.

DOUGLAS VAN DINE: Great, John. So rural districts—particular challenges that you run into there. So, let's shift gears now and look at Jen, who I think will bring a different perspective.

JENNIFER OVERLEY: Right. And Cherry Creek has a high teacher retention rate. So, we tend to hire and keep our teachers for a long time. We're a district that is highly sought after to teach in. But again, choosing who teaches the classes are site-based. And so many times, principals make that decision.

But many times, it's also based on seniority at the middle school level. So, if algebra is in middle school, the teacher who has the most seniority can have that option to teach that, whereas if algebra is in the high school, it's the opposite. So, it seems to be a course that teachers want to teach in middle school, probably because it's going to have the students who play school well and have played school well for a long time.

So, I think this data will help us make that decision in terms of the correlation between the tests that teachers have to take and also just the number of years they've been teaching. And we tend

to offer a lot of professional learning in math, although it seems to be a hard-to-fill position in high school and middle school as well, just teaching math in general.

DOUGLAS VAN DINE: Interesting that Algebra I in middle school is kind of a sought-after course to teach. But in high school, it's one of those at the bottom of the lists.

JENNIFER OVERLEY: Right.

DOUGLAS VAN DINE: Right. Well, thank you, John and Jen, for your insight. I'm going to turn it back to Mike to see whether we have any questions that we can ask.

MIKE SIEBERSMA: Yeah. The first question is one that Mary is going to speak to. And it goes back to—it was posed before our previous section. And the question's a technical one. Other than the state assessment, is there a third-party assessment that can be used to reliably identify student readiness for Algebra I?

MARY KLUTE: So there certainly are Algebra I readiness assessments that exist. And in our study, we didn't look at any of those. Our goal was to see if you could get some information that would be useful out of a test that students were already taking because there's all this concern about so many assessments of students.

However, I will say that our colleagues at REL West conducted a study not too long ago where they actually compared looking at the state assessment and looking at an Algebra I readiness test. And, so, I'll pop a link to that in the chat box if you'd like to take a look. That might be a good place for you to look to.

MIKE SIEBERSMA: Great. Thanks, Mary. I have another question. This one will be for Josh. And it's a technical question on the study of teacher qualifications. When you reference years of experience in the study, is that years teaching math or just straight-out teaching experience?

JOSHUA STEWART: Great question. We focused on years teaching math. So that years of experiences is solely focused on teaching mathematics.

MIKE SIEBERSMA: Great. This is kind of a broad question. And we might just do a really brief response from each of our people on this one. But if somebody came to this webinar and they're looking for, how do I make a successful middle school algebra program—and part of my thinking is that a successful middle school algebra program is inclusive. It's not just a certain set of students who probably look the same and always show up ready. It includes a diverse student population.

What could I do to create a successful program that serves lots of kids, all different kinds of kids? How do we prep for that kind of a successful program in addition to some of the technical things that our study showed? So, I'm going to start with the practitioners on this one and maybe start with John.

JOHN DOWNS: Well, that's the age-old question for everything, not just for mathematics. I guess one of the benefits—earlier I spoke to what might be viewed perhaps as some detriments of the smaller district in that our course offerings are not as diverse as a matter of necessity. And we struggle with teacher retention sometimes.

When we encounter situations, however, regarding students who struggle, working in a smaller school district has some benefits. If you think back to effective schools research from even the 1970s, you know the smaller student enrollment in a building, the less likely it is that students slip through the cracks because adults know who those kids are.

And so our district has a pretty successful professional learning communities implementation. And my faculty has, by and large, embraced wholly the foundational concept that all students are their students. And we're committed to the success of every child. And so that is the approach that we utilize. And we have adopted a "do whatever it takes" methodology to meet each student where they are and provide that student with the supports necessary to be successful.

MIKE SIEBERSMA: Thanks, John.

JOSHUA STEWART: This may be a simplistic answer, but that's the approach that we've taken in our smaller district.

MIKE SIEBERSMA: I'll get a quick response from Jen. And then I'll pitch that same question to Doug for a brief response. Jen?

JENNIFER OVERLEY: I agree. It's the age-old question. I think in math, because we tend to be a gatekeeper subject, it's perhaps critical that we think about that. I think we have really tried to implement just an idea across the board with mathematical mindset. And just that idea that all students have the potential to get to high levels of math. And our experiences influence our students' experiences in math. And just being aware of the experiences that we offer and how that plays out in our students.

And just focusing on that idea that we need to hear all voices in the room. And that takes different kinds of math experiences to get all voices in the room. It's not going to be your traditional, I teach you—we teach, you teach—or you do, whatever that old saying was. We really need to start with higher-level thinking tasks and get students talking and being accepting of mistakes. And I just think that whole mathematical mindset idea is critical.

MIKE SIEBERSMA: Thanks. Doug, you want to give us a brief set of thoughts on that and then take us home?

DOUGLAS VAN DINE: I think if we think about successful classrooms, it starts with the teacher. And I think that's where Josh's study is valuable. If we want this to be successful for everyone, we need to start with getting the right person in the classroom.

And then if we think of the students who are going to go in there—Mary talked about the study that she led with Missouri—that was looking at just one specific set of data. And I don't know if you caught what she said. But this was never meant to be, use the grade 7 math assessment as the only way to determine who should go in here. It's one ingredient in the entire picture.

So, when you're looking at getting a diverse classroom, it's looking at all of those pieces that come into play, with a grade 7 math assessment being one piece. It's talking to all of the teachers. It's looking at other success rates. And I want to build on what Jen said, too—is it doesn't start in grade 7. It starts in kindergarten. And setting out a math program that's aligned K to 12 is going to open the door to all students being successful and all students having those opportunities.

And being aware if there are cases where tracking does come into play—being really insightful as a district to say, we are aware that this does lead to tracking for this particular group. What should we do differently? So, I think all of those pieces come into play with really opening the door to a diverse classroom.

MIKE SIEBERSMA: For those outstanding questions, we'll try to get to you individually if we have a chance to respond after the webinar. We really appreciate all the great questions and the engagement.

DOUGLAS VAN DINE: And as we wrap up here, someone at the very beginning asked if this webinar recording is going to be available. And, yes—there will be a link sent to everyone who registered to the webinar recording, as well as a version of the PowerPoint so you can go through. And with that, too, Mike, if there were any questions that we didn't get to, we can probably put together a Q&A answer section to go along with that. And we can take some time to really make sure we have answers to all of those questions.

So. thank you, everyone, for joining us today. We appreciate you taking the time. John and Jen, thank you for joining us from the field. Mary and Josh, thank you for sharing your research insights from the reports that you've put together. And Mike, thank you for leading us through this entire charge. So again, have a great day, everyone. And we hope to see you around next time.